SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	42.0” WXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Display Co., Ltd.
*MODEL	LC420WXE
SUFFIX	SBA1 (RoHS Verified)

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE / DATE
/	
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/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	SIGNATURE / DATE
J. T Kim / Team Leader	
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TV Products Development Dept.
LG. Display LCD Co., Ltd

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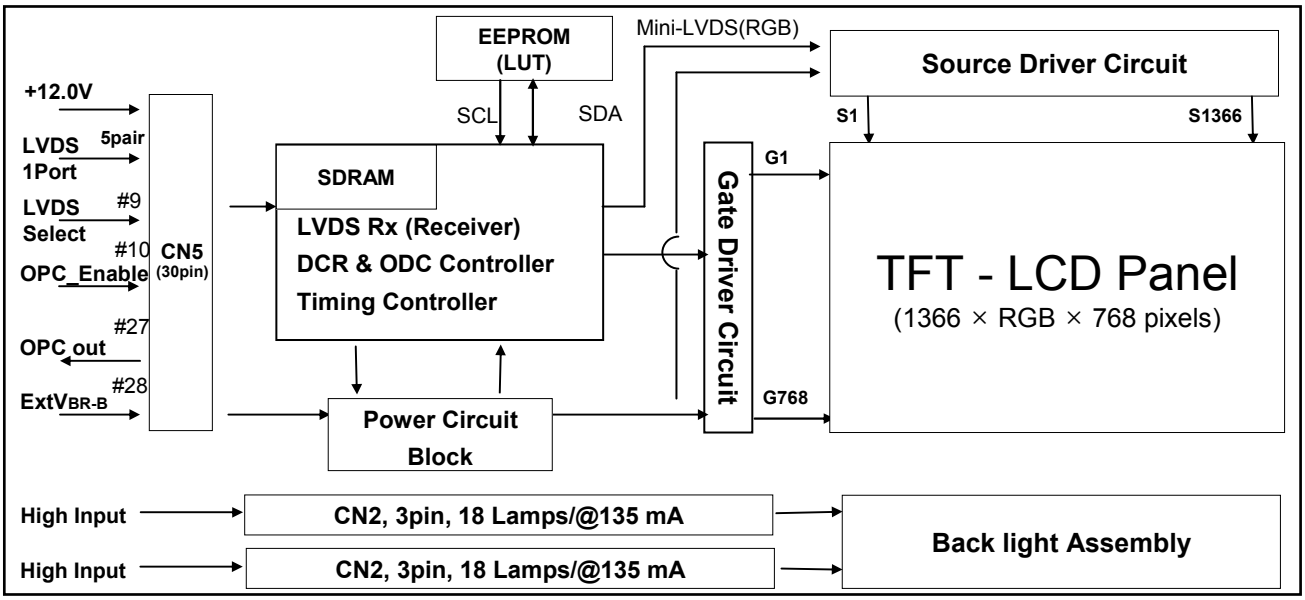
RECORD OF REVISIONS

Revision No.	Revision Date	Page	Description
0.0	Jun, 25, 2008	-	CAS Version 0.0 Release
0.1	Sep, 10, 2008	4	Update Haze % for Front Polarizer
		16,17	Update Optical Characteristics (Color Coordinates , G-to-G)
		22	Update Mechanical Drawing for Rear view (Guide Lamp added)
0.2	Sep, 20, 2008	-	Update Appendix VI for LVDS Characteristics
1.0	Jan, 07, 2009	21-22	Update Mechanical Drawings for front and rear view
			Final Specification

1. General Description

The LC420WXE is a Color Active Matrix Liquid Crystal Display with an integral External Electrode Fluorescent Lamp(EEFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 42.0 inch diagonally measured active display area with WXGA resolution (768 vertical by 1366 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus presenting a palette of more than 16.7M(true) colors.
It has been designed to apply the 8-bit 1-port LVDS interface.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	42.02 inches(1067.308mm) diagonal
Outline Dimension	983 mm(H) x 576 mm(V) x 46.0 mm(D) including T-CON Cover Shield (Typ.)
Pixel Pitch	0.227mm x 0.681mm x RGB
Pixel Format	1366 horiz. by 768 vert. Pixels RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors
Luminance, White	500 cd/m^2 (Center 1-point) (Typ.)
Viewing Angle (CR>10)	Viewing Angle Free (R/L 178 (Typ.), U/D 178 (Typ))
Power Consumption	Total 158.3W (Typ.) (Logic=4.3W, Backlight=154W @ with Inverter)
Weight	10.0 (Typ.)
Display Operating Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(663H), Anti-glare treatment of the front polarizer (Haze 10%)

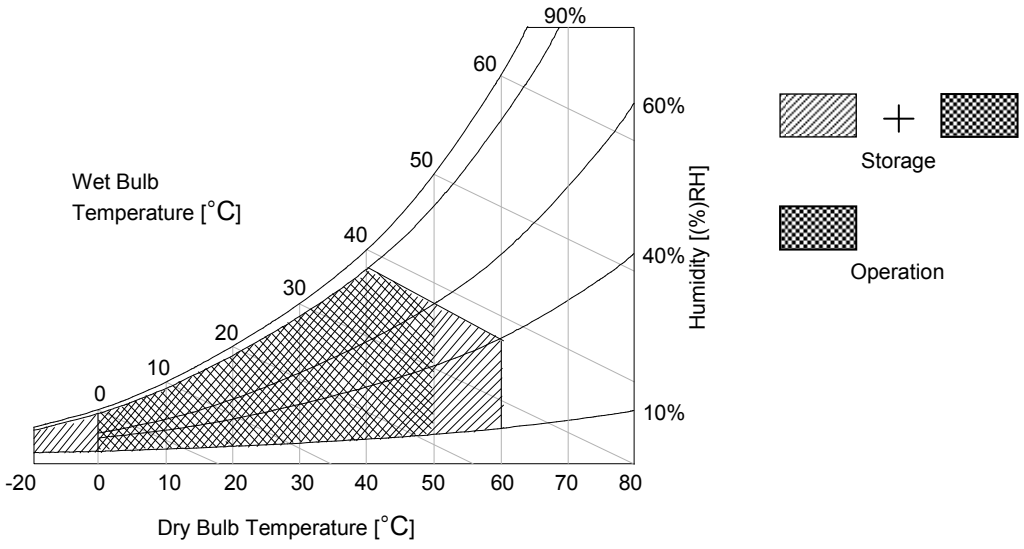
2. Absolute Maximum Ratings

The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Remark
			Min	Max		
Power Input Voltage	LCD circuit	V_{LCD}	+8.0	+14.0	V [DC]	at 25 ± 2 °C
B/L Input voltage	Operating Voltage (one side)	V_{OP}	700	1100	V [RMS]	at 25 ± 2 °C Burst Dimming Duty 100%
Option Input Voltage (LVDS Select)		V_I	-0.3V	+3.6V		Page 9 #9 pin
Operating Temperature		T_{OP}	0	+50	°C	Note 1
Storage Temperature		T_{ST}	-20	+60	°C	
Operating Ambient Humidity		H_{OP}	10	90	%RH	
Storage Humidity		H_{ST}	10	90	%RH	

Note 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C Max, and no condensation of water.
2. Gravity mura can be guaranteed under 40 °C condition.



3. Electrical Specifications

3-1. Electrical Characteristics

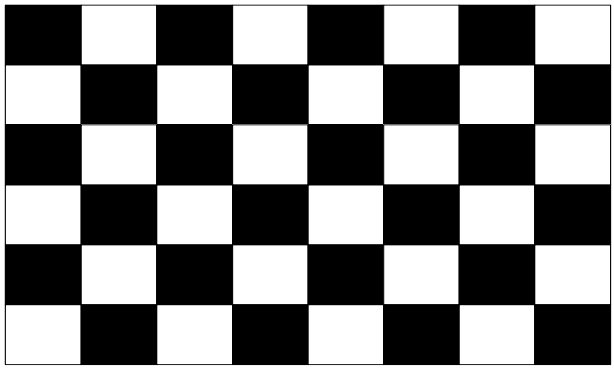
It requires two power inputs. One is employed to power for the LCD circuit. The other input power for the EEFL Backlight.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Circuit :						
Power Input Voltage	V_{LCD}	11.4	12.0	12.6	V [DC]	
Power Input Current	I_{LCD}	-	358	465	mA	1
		-	460	598	mA	2
Power Consumption	P_{LCD}		4.30	5.58	Watt	1
Rush current	I_{RUSH}	-	-	3.0	A	3

Note : 1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2°C, f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

Table 3. ELECTRICAL CHARACTERISTICS of Back Light Assembly & Lamp (Continue)

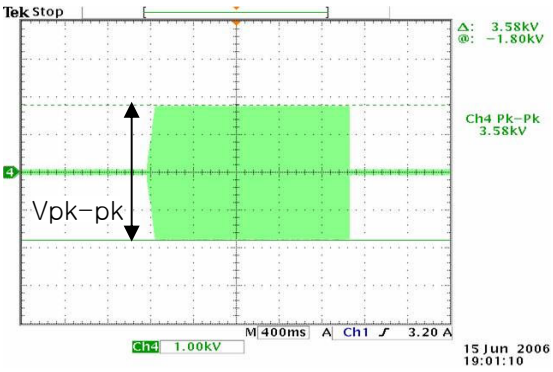
Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Backlight Assembly :							
Operating Voltage (one side,fBL=63KHz,IBL= 135mArms)		VBL	800	950	1100	V_{RMS}	1, 2
Operating Current (one side)		IBL	126	135	144	mA_{RMS}	1
Established Starting Voltage (one side)	0℃	VS		-	1200	V_{RMS}	1, 3
	25℃			-	1000		
Operating Frequency		fBL	60	62	64	kHz	4
Striking Time		S TIME	-	-	1.5	sec	3
Power Consumption		PBL		154		Watt	6
Burst Dimming Duty		PWM duty	20		100	%	9
Burst Dimming Frequency		1/T	98	-	182	Hz	9

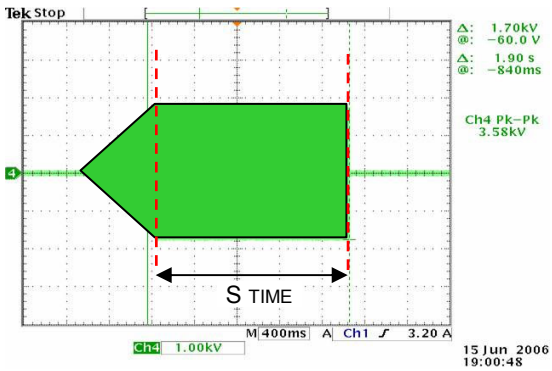
Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Lamp : (APPENDIX-VI)							
Lamp Voltage (one side)		VLAMP	850	1000	1050	V_{RMS}	1, 2
Lamp Current (one side)		ILAMP	3	7.5	8	mA_{RMS}	1
Discharge Stabilization Time		TS	-	-	3	Min	1, 5
Lamp Frequency		f LAMP	40	65	80	KHz	
Lamp Temperature		TLAMP			130	°C	
Established Starting Voltage (one side)	0℃	VS			1200	V_{RMS}	1, 3
	25℃	VS			1000		
Life Time			50,000			Hrs	7

Note : The design of the inverter must have specifications for the lamp in LCD Assembly.
The electrical characteristics of inverter are based on High-High Driving type.
The performance of the lamps in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So, all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.
When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) has never been occurred. When you confirm it, the LCD– Assembly should be operated in the same condition as installed in your instrument.

※ Do not attach a conductive tape to lamp connecting wire.
If you attach conductive tape to the lamp wire, not only luminance level can be lower than typical one but also inverter operate abnormally on account of leakage current which is generated between lamp wire and conductive tape.

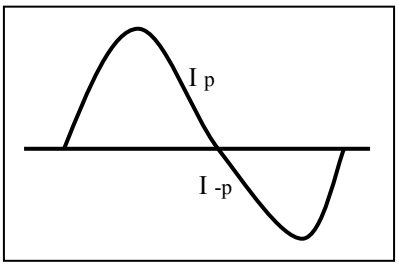
1. Specified values are defined for a Backlight Assembly.(IBL : 18 lamp, 7.5mA/Lamp)
2. Operating voltage is measured at 25 ± 2°C(after 2hr.aging). The variance range for operating voltage is ± 10%.
3. The established starting voltage [VS] should be applied to the lamps for more than Striking time (S TIME) for start-up. Inverter open voltage must be more than established starting voltage. Otherwise, the lamps may not be turned on. The used lamp current is typical value.





Vs = (Vpk-pk) / [2*root(2)]

4. Lamp frequency may produce interference with horizontal synchronous frequency.As a result this may cause beat on the display. Therefore, lamp frequency shall be away as much as possible from the horizontal synchronous frequency and its harmonics range in order to prevent interference.
   There is no reliability problem of lamp, if use out of range of operation frequency (40 kHz~80 kHz) on CAS
5. The brightness of the lamp after lighted for 5minutes is defined as 100%.
   T_S is the time required for the brightness of the center of the lamp to be not less than 95% at typical current.
   The screen of LCD module may be partially dark by the time the brightness of lamp is stable after turn on.
6. Maximum level of power consumption is measured at initial turn on.
   Typical level of power consumption is measured after 2hrs aging at 25 ± 2°C.
7. The life time is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2°C, based on duty 100%.
8. The output of the inverter must have symmetrical(negative and positive) voltage and current waveform (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has not only unsymmetrical voltage and current but also spike wave.
   Requirements for a system inverter design, which is intended to achieve better display performance, power efficiency and more reliable lamp characteristics.
   It can help increase the lamp lifetime and reduce leakage current.
   a. The asymmetry rate of the inverter waveform should be less than 10%.
   b. The distortion rate of the waveform should be within √2 ±10%.
   * Inverter output waveform had better be more similar to ideal sine wave.



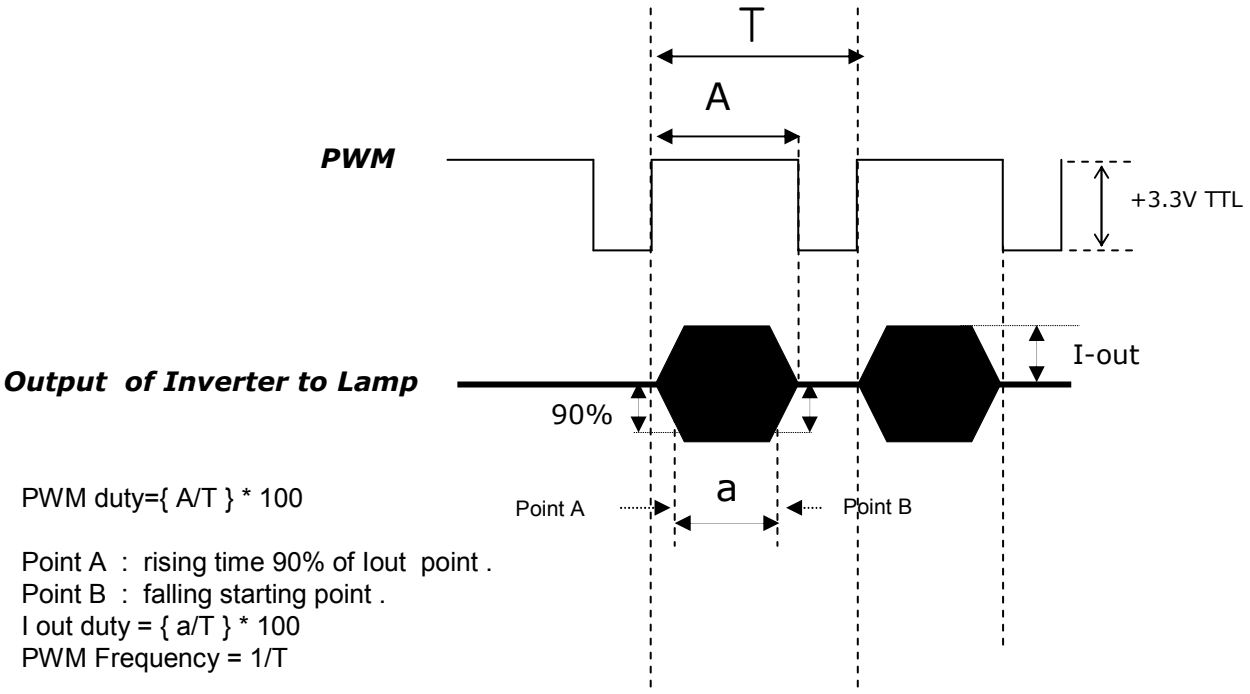
* Asymmetry rate:

$| I_p - I_{-p} | / I_{op} \times 100\%$

* Distortion rate

I_p (or I_{-p}) / I_{op}

9. The reference method of burst dimming duty ratio.
   It is recommended to use synchronous V-sync frequency to prevent waterfall
   (Vsync x 2 =Burst Frequency)
   Though PWM frequency is over 182Hz (max252Hz), function of backlight is not affected.



PWM duty={ A/T } * 100

Point A : rising time 90% of Iout point .
Point B : falling starting point .
I out duty = { a/T } * 100
PWM Frequency = 1/T

※ We recommend not to be much different between PWM duty and Iout duty .
※ Dimming current output rising and falling time may produce humming and inverter trans' sound noise.
※ Burst dimming duty should be 100% for more than 1second after turn on.
※ Equipment
   Oscilloscope :TDS3054B(Tektronix)
   Current Probe : P6022 AC (Tektronix)
   High Voltage Probe: P5100(Tektronix)

11. The operating current must be measured as near as backlight assembly input.

12. The operating current unbalance between left and right must be under 10% of Typical current
   ｜Left(Master) current – Right(Slave) Current｜ 〈 10% of typical current

3-2. Interface Connections

This LCD module employs two kinds of interface connection, a 30-pin connector is used for the module electronics and 14-pin connector is used for the integral backlight system.

3-2-1. LCD Module

- LCD Connector(CN5) : FI-X30SSL-HF (Manufactured by JAE) or IS100-L30B-C23(Manufactured by UJU)
- Mating Connector : FI-X30C2L (Manufactured by JAE) or Equivalent

Table 4. MODULE CONNECTOR(CN5) PIN CONFIGURATION

Pin No.	Symbol	Description	Note
1	V_{LCD}	Power Supply +12.0V	
2	V_{LCD}	Power Supply +12.0V	
3	V_{LCD}	Power Supply +12.0V	
4	V_{LCD}	Power Supply +12.0V	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	LVDS Select	'H' =JEIDA , 'L' or NC = VESA	**Appendix V, VII**
10	OPC_Enable	'H' = Enable , 'L' = Disable	**Appendix V**
11	GND	Ground	
12	RA-	LVDS Receiver Signal(-)	
13	RA+	LVDS Receiver Signal(+)	
14	GND	Ground	
15	RB-	LVDS Receiver Signal(-)	
16	RB+	LVDS Receiver Signal(+)	
17	GND	Ground	
18	RC-	LVDS Receiver Signal(-)	
19	RC+	LVDS Receiver Signal(+)	
20	GND	Ground	
21	RCLK-	LVDS Receiver Clock Signal(-)	
22	RCLK+	LVDS Receiver Clock Signal(+)	
23	GND	Ground	
24	RD-	LVDS Receiver Signal(-)	
25	RD+	LVDS Receiver Signal(+)	
26	GND	Ground	
27	OPC OUT	OPC output (From LCM)	
28	Ext V_{BR-B}	External VBR (From System)	
29	GND	Ground	
30	GND	Ground	

Notes :
1. All GND(ground) pins should be connected together to the LCD module's metal frame.
2. All VLCD (power input) pins should be connected together.
3. All Input levels of LVDS signals are based on the **EIA 644** Standard.
4. Specific pins**(pin No. #10, #27~#28)** are used for **OPC function** of the LCD module.
   If not used, these pins are no connection. (Please see the **Appendix V** for more information.)
5. Specific pin No. **#30** is used for "No signal detection" of system signal interface.
   It should be GND for **NSB(No Signal Black)** during the system interface signal is not.
   If this pin is "H", LCD Module displays **AGP(Auto Generation Pattern).**

3-2-2. Backlight Module

[Master]

1) Balance Connector

: 65002WS-03 (manufactured by YEONHO)or equivalent

2) Mating Connector

: 65002HS-03 (manufactured by YEONHO) or equivalent.

[Slave]

1) Balance Connector

: 65002WS-03 (manufactured by YEONHO)or equivalent

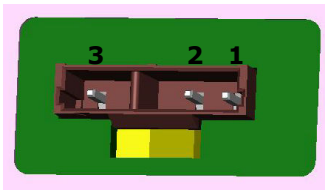
2) Mating Connector

: 65002HS-03 (manufactured by YEONHO) or equivalent.

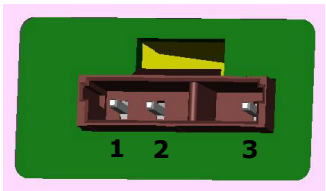
Table 5. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3)

No	Symbol	Master	Slave	Note
1	**H_Input**	High_Input	High_Input	
2	**H_Input**	High_Input	High_Input	
3	**FB**	NC	NC	

◆ Rear view of LCM



Master



Slave

[Note]

1. LGD recommends that Inverter Burst dimming frequency (PWM Frequency) should be synchronized with Sync signal.

2. LGD recommends that Inverter Burst dimming frequency (PWM Frequency) should be 100Hz or 120Hz in terms of waterfall noise.

3-3. Signal Timing Specifications

Table 6-1& 6-2 show the signal timing required at the input of the LVDS transmitter. All of the interface signal timings should be satisfied with the following specification for normal operation.

Table 6-1. TIMING TABLE for NTSC **[DE (Data Enable) Only]**

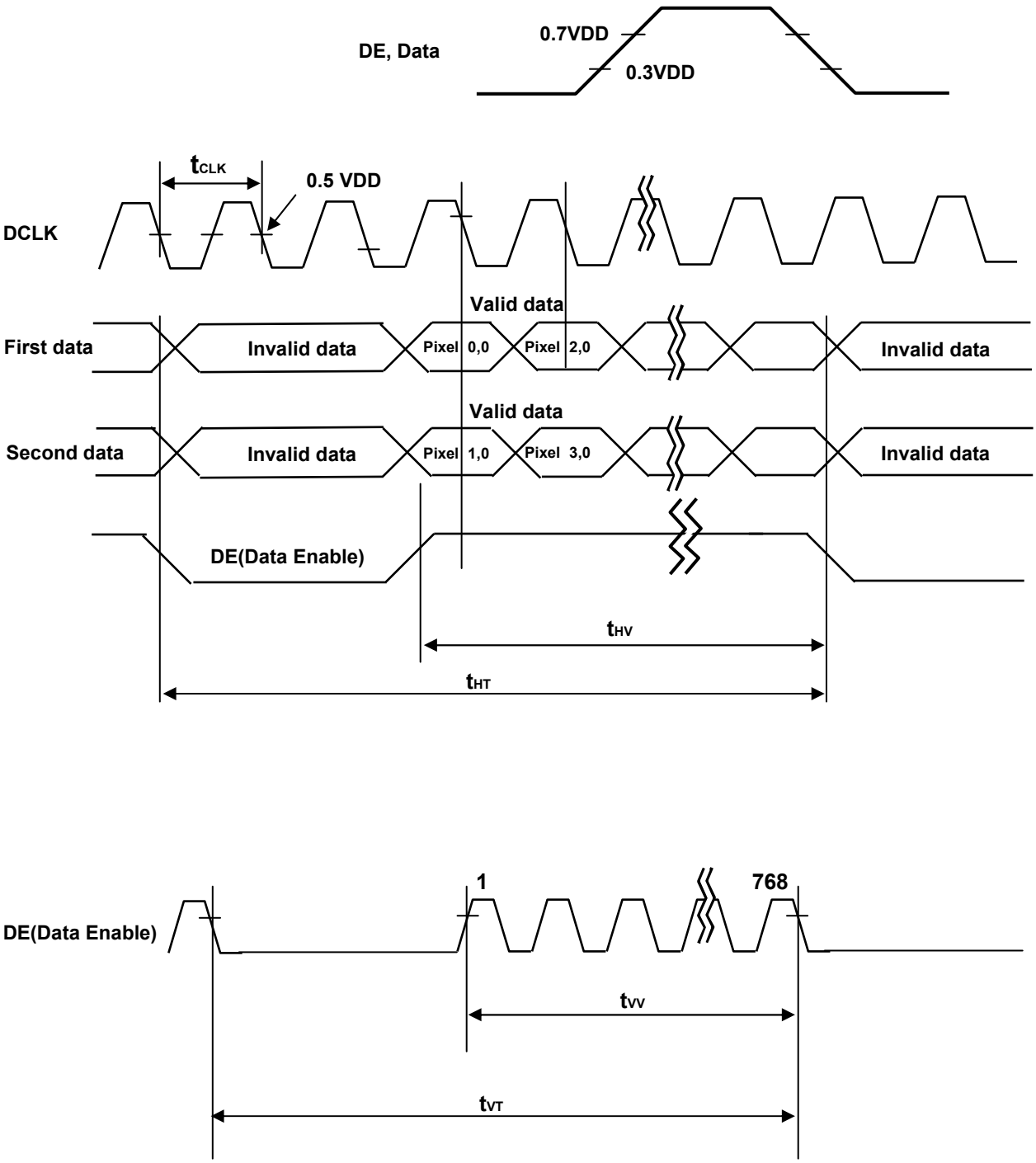
Item		Symbol	Min.	Typ.	Max.	Unit	Notes
DCLK Period		t_{CLK}	12.5	13.8	15.8	nsec	
DCLK Frequency		f_{CLK}	63.0	72.4	80.0	MHz	
Vertical	Frequency	f_V	57	60	63	Hz	
	Valid	t_{VV}	-	768	-	Line	
	Blank	$t_{VT} - t_{VV}$	8	22	295	Line	
	Total	t_{VT}	776	790	1063	Line	
Horizontal	Frequency	f_H	45	47.4	50	KHz	
	Valid	t_{HV}	-	1366	-	t_{CLK}	
	Blank	$t_{HT} - t_{HV}$	90	162	410	t_{CLK}	
	Total	t_{HT}	1456	1528	1776	t_{CLK}	

Table 6-2. TIMING TABLE for PAL

Item		Symbol	Min.	Typ.	Max.	Unit	Notes
DCLK Period		t_{CLK}	12.5	13.8	15.8	nsec	
DCLK Frequency		f_{CLK}	63.0	72.4	80.0	MHz	
Vertical	Frequency	f_V	47	50	53	Hz	
	Valid	t_{VV}	-	768	-	Line	
	Blank	$t_{VT} - t_{VV}$	8	180	295	Line	
	Total	t_{VT}	776	948	1063	Line	
Horizontal	Frequency	f_H	45	47.4	50	KHz	
	Valid	t_{HV}	-	1366	-	t_{CLK}	
	Blank	$t_{HT} - t_{HV}$	90	162	410	t_{CLK}	
	Total	t_{HT}	1456	1528	1776	t_{CLK}	

Note : 1. The input of HSYNC & VSYNC signal does not have an effect on normal operation(DE Only Mode).
If you use spread spectrum of EMI, add some additional clock to minimum value for clock margin.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency
3. Timing should be set based on clock frequency.

3-4. Signal Timing Waveforms



3-5. Color Data Reference

The brightness of each primary color(red,green,blue) is based on the 8-bit gray scale data input for the color. The higher binary input, the brighter the color. Table 7 provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	...					...								...								...			
	RED (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	...					...								...								...			
	GREEN (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	...					...								...								...			
	BLUE (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

3-6. Power Sequence

3-6-1. LCD Driving circuit

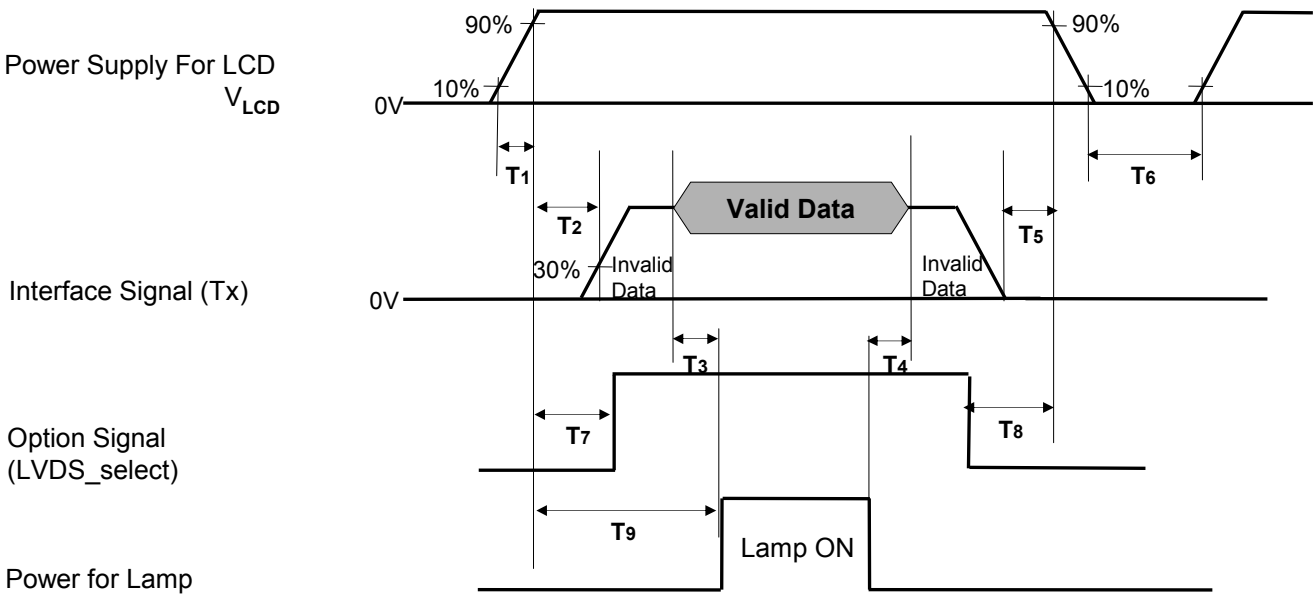


Table 8. POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	
T2	0.5	-	-	ms	4
T3	200	-	-	ms	3
T4	200	-	-	ms	3
T5	0	-	-	ms	
T6	2.0	-	-	s	5
T7	0.5	-	**T2**	ms	4
T8	0	-	-	ms	4
T9	**T2** + **T3**	-	5	s	

Note : 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply V_{LCD} to 0V.
3. The **T3** / **T4** is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.
4. If the on time of signals(Interface signal and Option signals) precedes the on time of Power(V_{LCD}), it will be happened abnormal display.
5. **T6** should be measured after the Module has been fully discharged between power off and on period.

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25±2°C. The values are specified at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
It is presented additional information concerning the measurement equipment and method in FIG. 1.

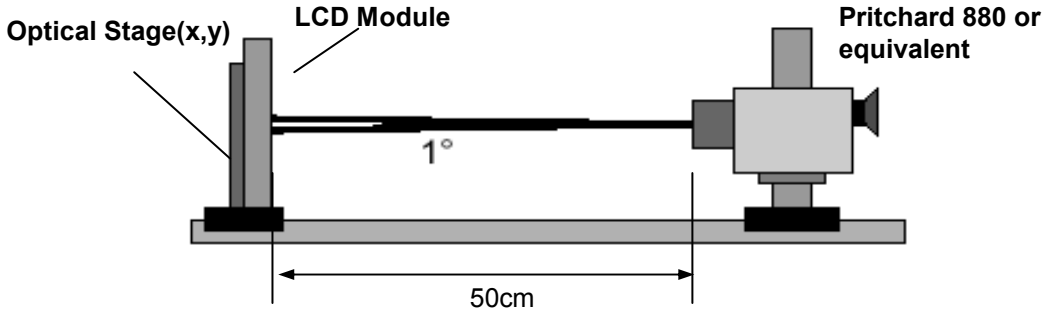


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 9. OPTICAL CHARACTERISTICS **Ta= 25±2°C, V_{LCD}=12.0V, fv=60Hz, Dclk=72.4MHz, I_{BL}=135mA_{rms}**

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	800	1200			1
Surface Luminance, white		L_{WH}	400	500		cd/m^2	2
Luminance Variation		δ_{WHITE} 5P			1.3		3
		δ_{BLACK} 5P			1.7		
Response Time	Gray-to-Gray	G to G	-	5	8	ms	4
	Uniformity	$\delta_{G\ TO\ G}$	-	-	1	ms	5
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.637	Typ +0.03		
		Ry		0.335			
	GREEN	Gx		0.290			
		Gy		0.611			
	BLUE	Bx		0.145			
		By		0.062			
	WHITE	Wx		0.279			
		Wy		0.292			
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	89	-	-	degree	6
	x axis, left (ϕ=180°)	θl	89	-	-		
	y axis, up (ϕ=90°)	θu	89	-	-		
	y axis, down (ϕ=270°)	θd	89	-	-		
Gray Scale			-	-	-		7

Note : 1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

It is measured at center 1-point.

2. Surface luminance are determined after the unit has been 'ON' and 1 Hour after lighting the backlight in a dark environment at 25±2°C. Surface luminance is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 2.

3. The variation in surface luminance , δ WHITE is defined as :

$$\delta \text{ WHITE(5P)} = \text{Maximum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5}) / \text{Minimum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5})$$

Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information, see the FIG. 2.

4. Response time is the time required for the display to transition from G(N) to G(M) (Rise Time, Tr_R) and from G(M) to G(N) (Decay Time, Tr_D). For additional information see the FIG. 3. (N<M)
※ G to G Spec stands for average value of all measured points.
Photo Detector : RD-80S / Field : 2˚

5. Gray to Gray Response time uniformity is Reference data. Please see **Appendix VIII**.

6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 4.

7. Gray scale specification
Gamma Value is approximately 2.2. For more information, see the Table 10.

Table 10. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)
L0	0.08
L15	0.28
L31	1.05
L47	2.50
L63	4.69
L79	7.67
L95	11.47
L111	16.11
L127	21.64
L143	28.07
L159	35.43
L175	43.73
L191	52.99
L207	63.23
L223	74.47
L239	86.72
L255	100

Measuring point for surface luminance & measuring point for luminance variation

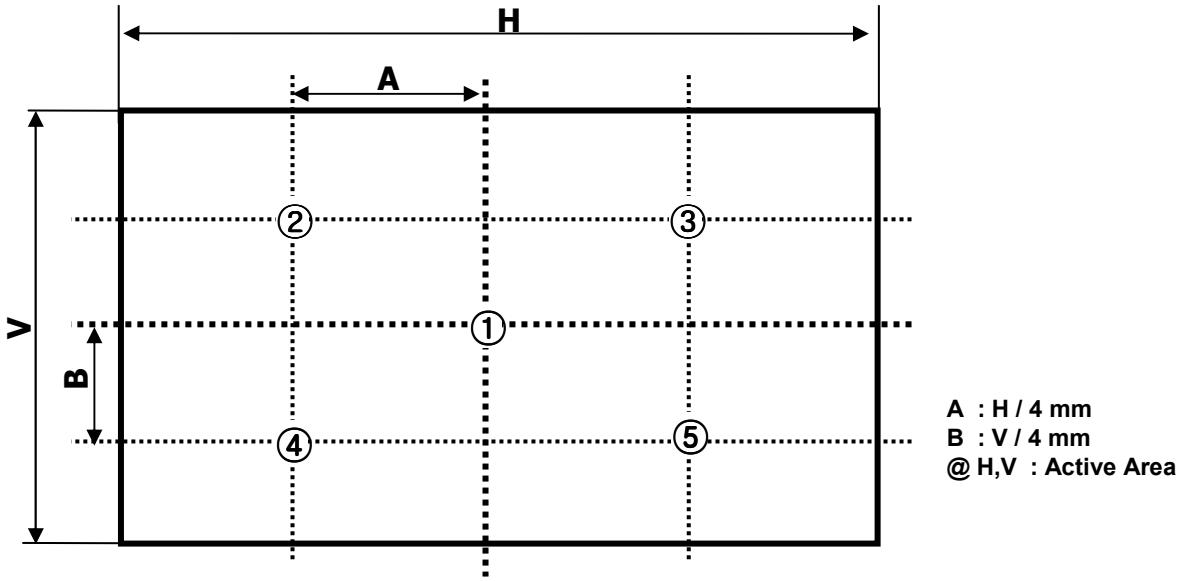


FIG.2 Measure Point for Luminance

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

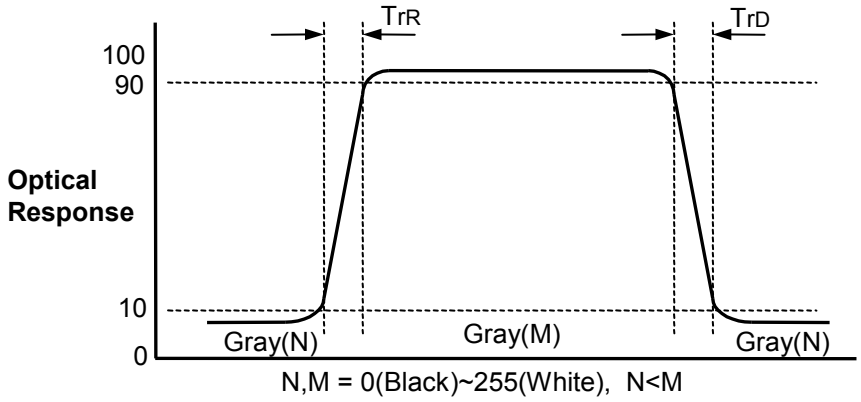


FIG.3 Response Time

Dimension of viewing angle range

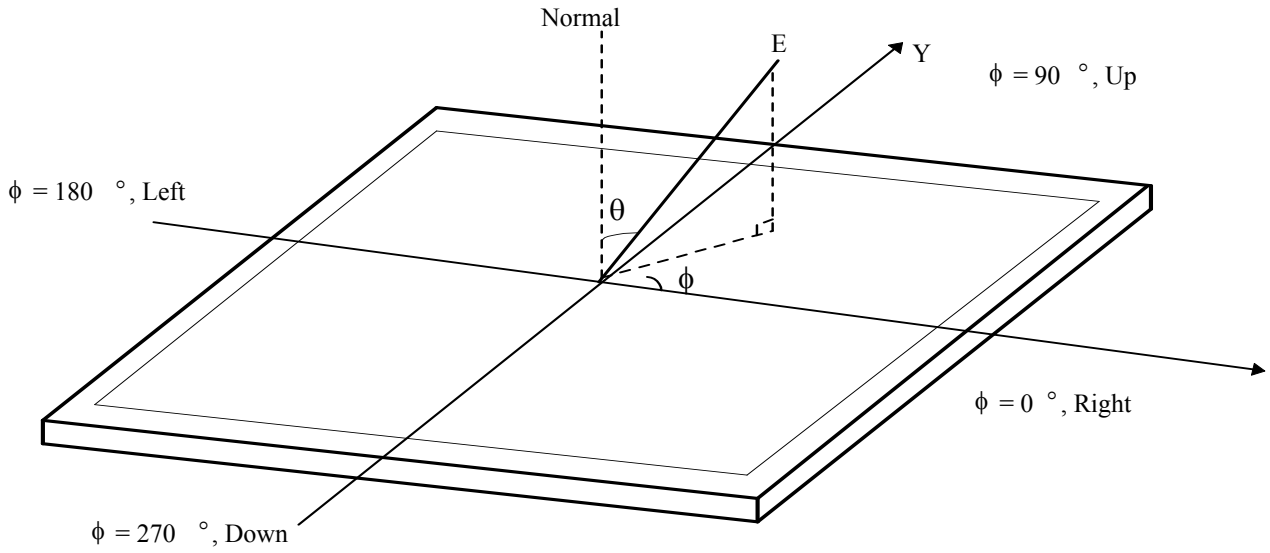


FIG.4 Viewing Angle

5. Mechanical Characteristics

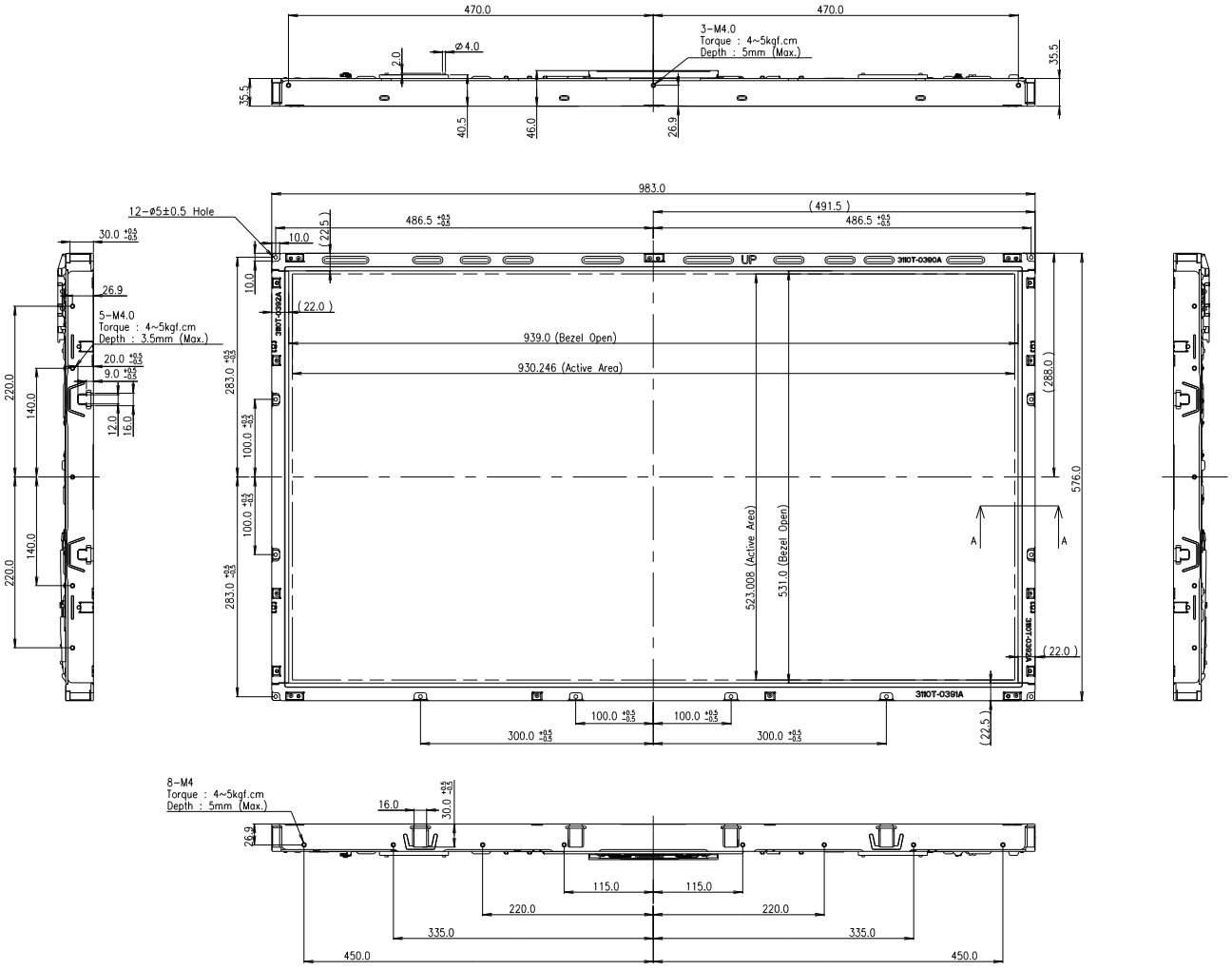
The contents provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD module.

Table 11. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension	Horizontal	983.0 mm
	Vertical	576.0 mm
	Depth	47.3 mm
Bezel Area	Horizontal	939.0 mm
	Vertical	531.0 mm
Active Display Area	Horizontal	930.25 mm
	Vertical	523.01 mm
Weight	10.0 Kg (Typ.) , 10.5 Kg (Max.)	
Surface Treatment	Hard coating(3H) Semi-glare treatment of the front polarizer	

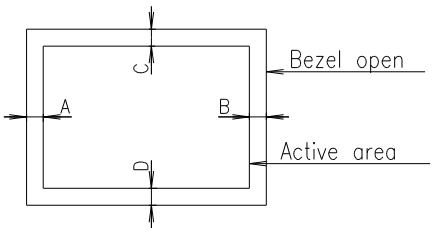
Note : 1.Please refer to a mechanic drawing in terms of tolerance at the next page.

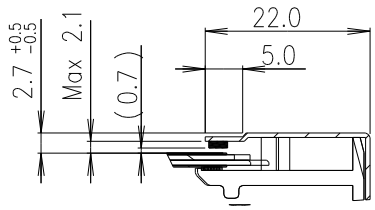
<FRONT VIEW>



NOTES

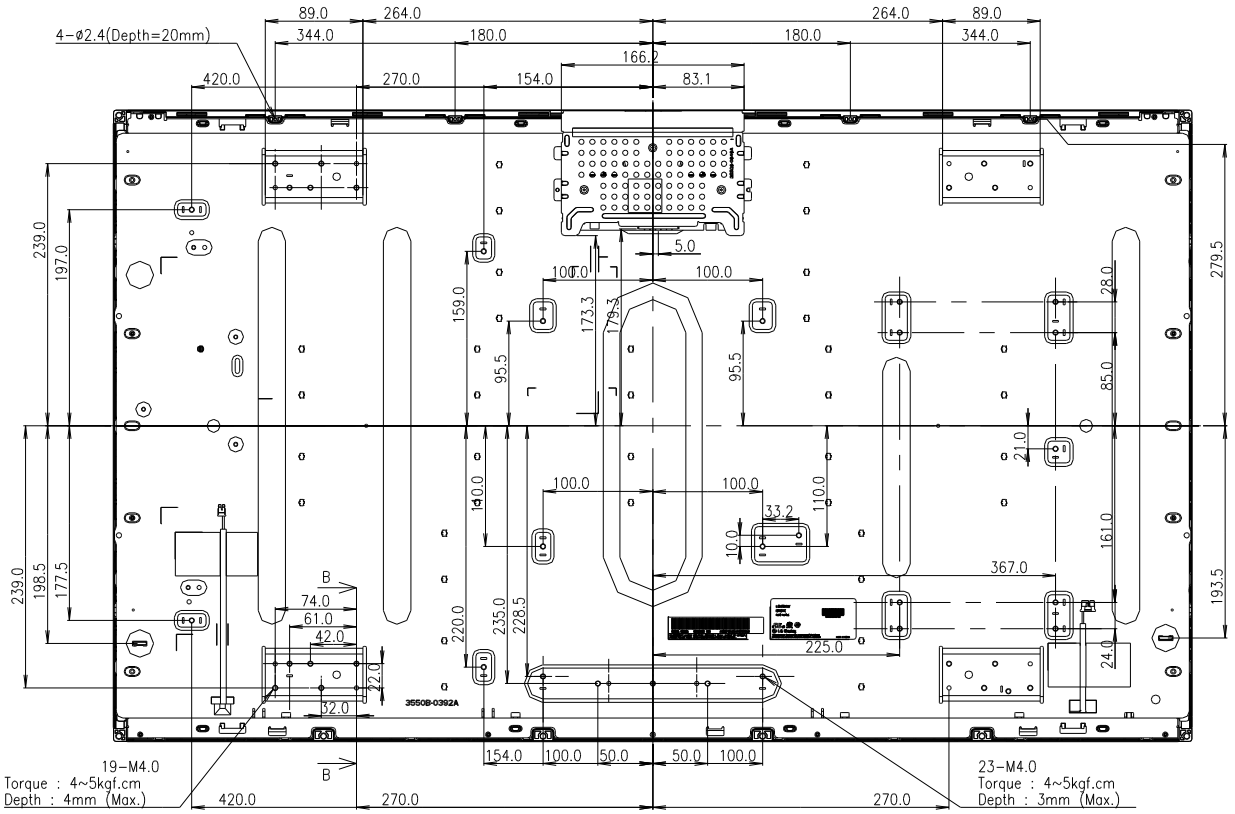
1. Unspecified tolerances are to be ±1.0mm.
2. Tilt and partial disposition tolerance of display are are as following.
   (1) X-Direction : IA-BI ≤ 1.5mm
   (2) Y-Direction : IC-DI ≤ 1.5mm

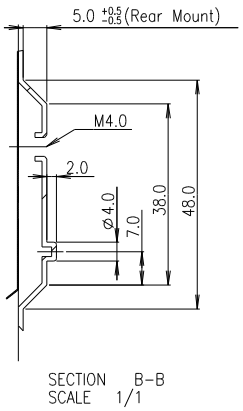




SECTION A-A
SCALE 1/1

<REAR VIEW>


4-ø2.4(Depth=20mm)
89.0
264.0
344.0
180.0
166.2
420.0
270.0
154.0
83.1
239.0
197.0
159.0
173.3
179.3
95.5
5.0
100.0
28.0
279.5
85.0
21.0
110.0
33.2
10.0
161.0
367.0
193.5
198.5
177.5
74.0
61.0
42.0
22.0
32.0
220.0
235.0
228.5
225.0
24.0
3550B-0392A
154.0
50.0
19-M4.0
Torque : 4~5kgf.cm
Depth : 4mm (Max.)
23-M4.0
Torque : 4~5kgf.cm
Depth : 3mm (Max.)
2-ø4.0
3.0
2.0


5.0 +0.5 -0.5 (Rear Mount)
M4.0
2.0
ø4.0
7.0
38.0
48.0
SECTION B-B
SCALE 1/1

6. Reliability

Table 12. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C, 75%RH, 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 60%RH 240h
4	Low temperature operation test	Ta= 0°C 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min Each direction per 10 min
6	Shock test (non-operating)	Shock level : 50Grms Waveform : half sine wave, 11ms Direction : ±X, ±Y, ±Z One time each direction
7	Humidity condition Operation	Ta= 40 °C ,90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.

7. International standards

7-1. Safety

a) UL 60065, 7th Edition, dated June 30, 2003, Underwriters Laboratories, Inc., Standard for Audio, Video and Similar Electronic Apparatus.

b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association, Standard for Audio, Video and Similar Electronic Apparatus.

c) IEC60065:2001, 7th Edition CB-scheme and EN 60065:2002, Safety requirements for Audio, Video and Similar Electronic Apparatus..

7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. “American National Standards Institute(ANSI), 1992

b) CISPR13 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
CISPR22 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" International Special Committee on Radio Interference.

c) EN55013 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
EN55022 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" European Committee for Electro Technical Standardization.(CENELEC), 1988(Including A1:2000)

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 13 pcs

b) Box Size :1140 mm(L) X 990 mm(W) X 810 mm(H)

9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

9-1. Mounting Precautions

(1) You must mount a module using specified mounting holes (Details refer to the drawings).
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer. * There is no problem of Panel crack under 5kgf / ϕ10mm
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw.
(if not, it causes metallic foreign material and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.
(10) It is recommended to avoid the signal cable and conductive material over the inverter transformer for it can cause the abnormal display and temperature rising.
(11) Partial darkness may happen during 3~5 minutes when LCM is operated initially in condition that luminance is under 40% at low temperature (under 5℃). This phenomenon which disappears naturally after 3~5 minutes is not a problem about reliability but LCD characteristic.

9-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

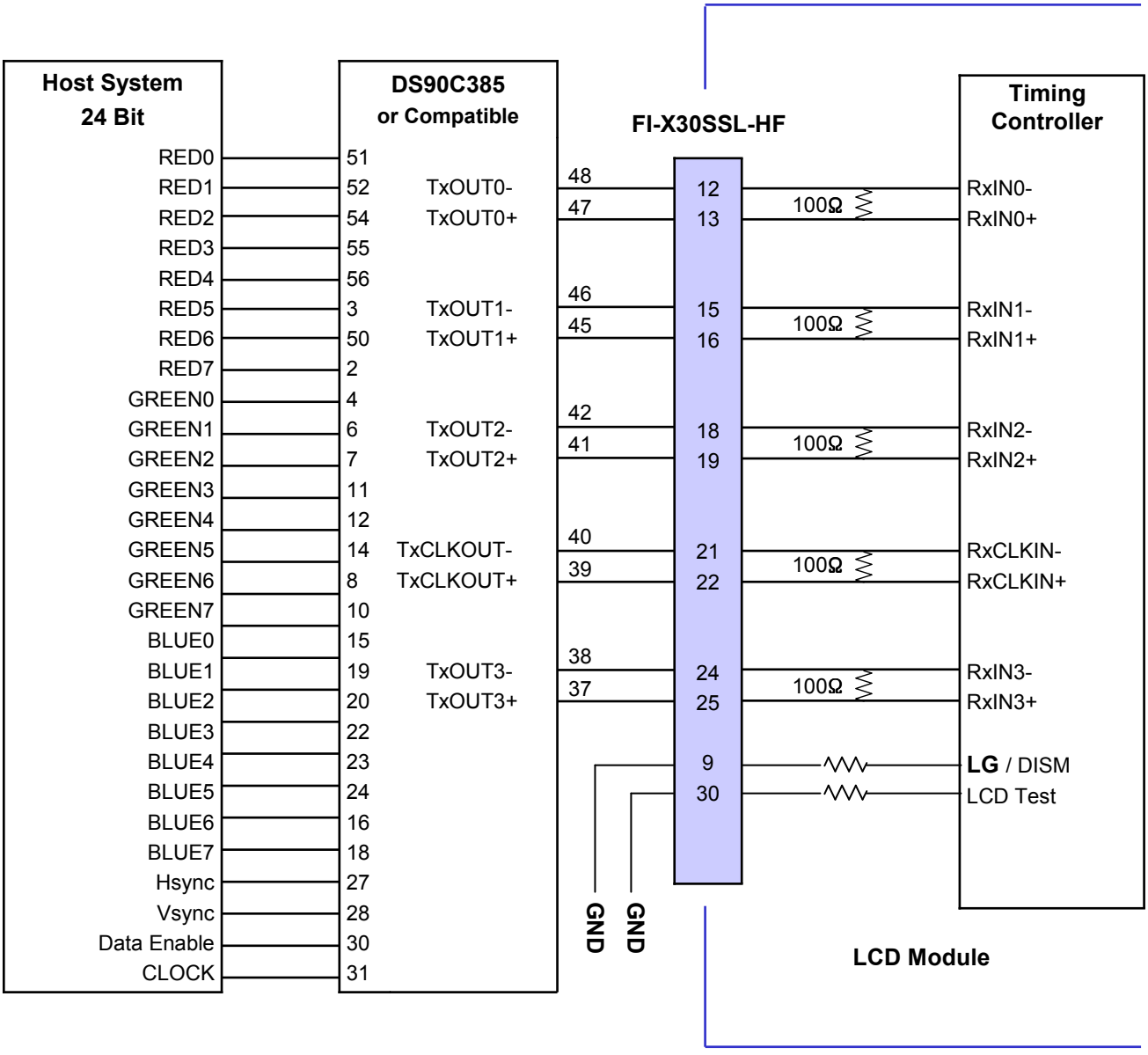
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. Handling Precautions for Protection Film

(1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

APPENDIX-I-1

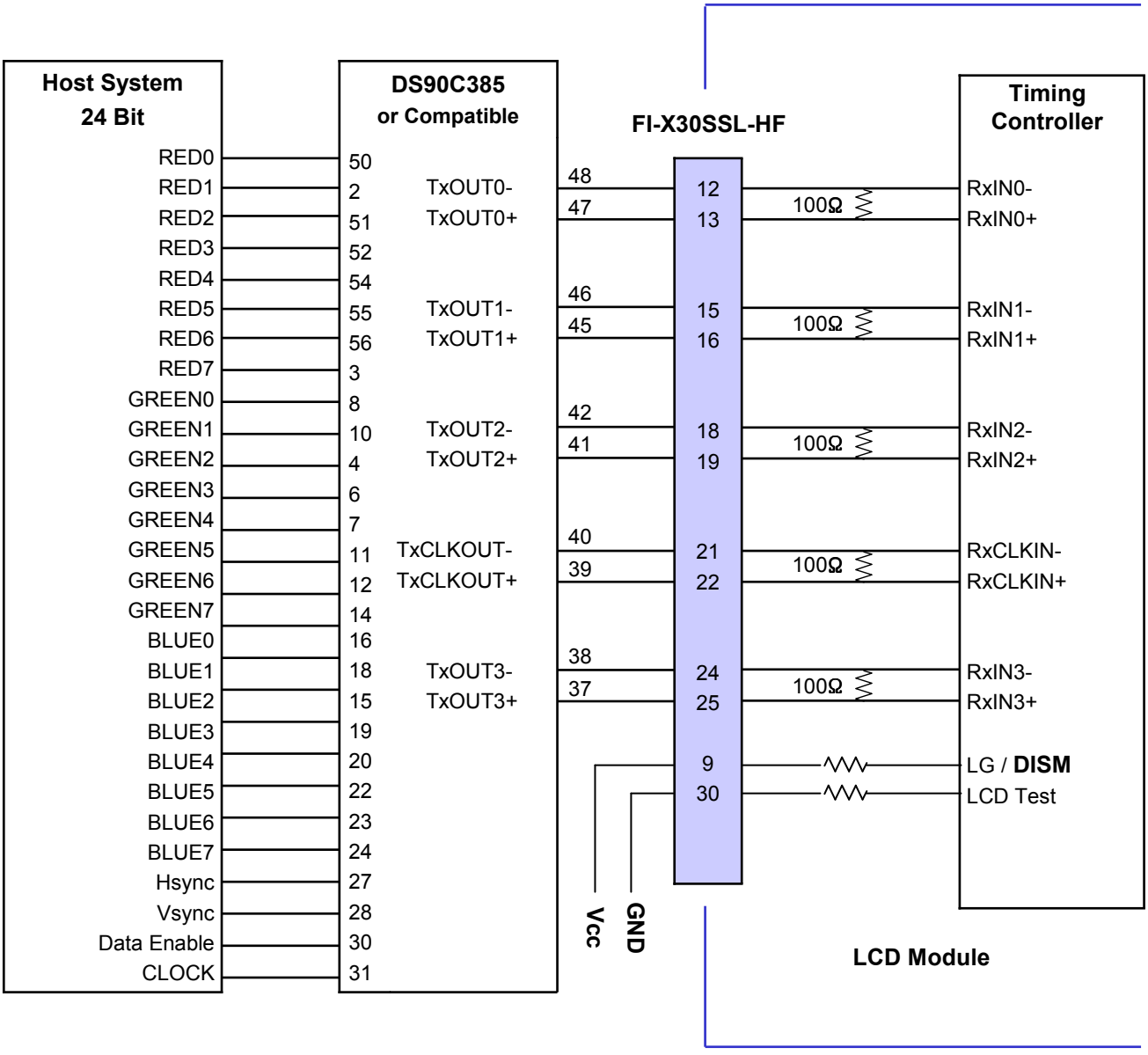
■ REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="L")



Note: 1. The LCD Module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

APPENDIX-I-2

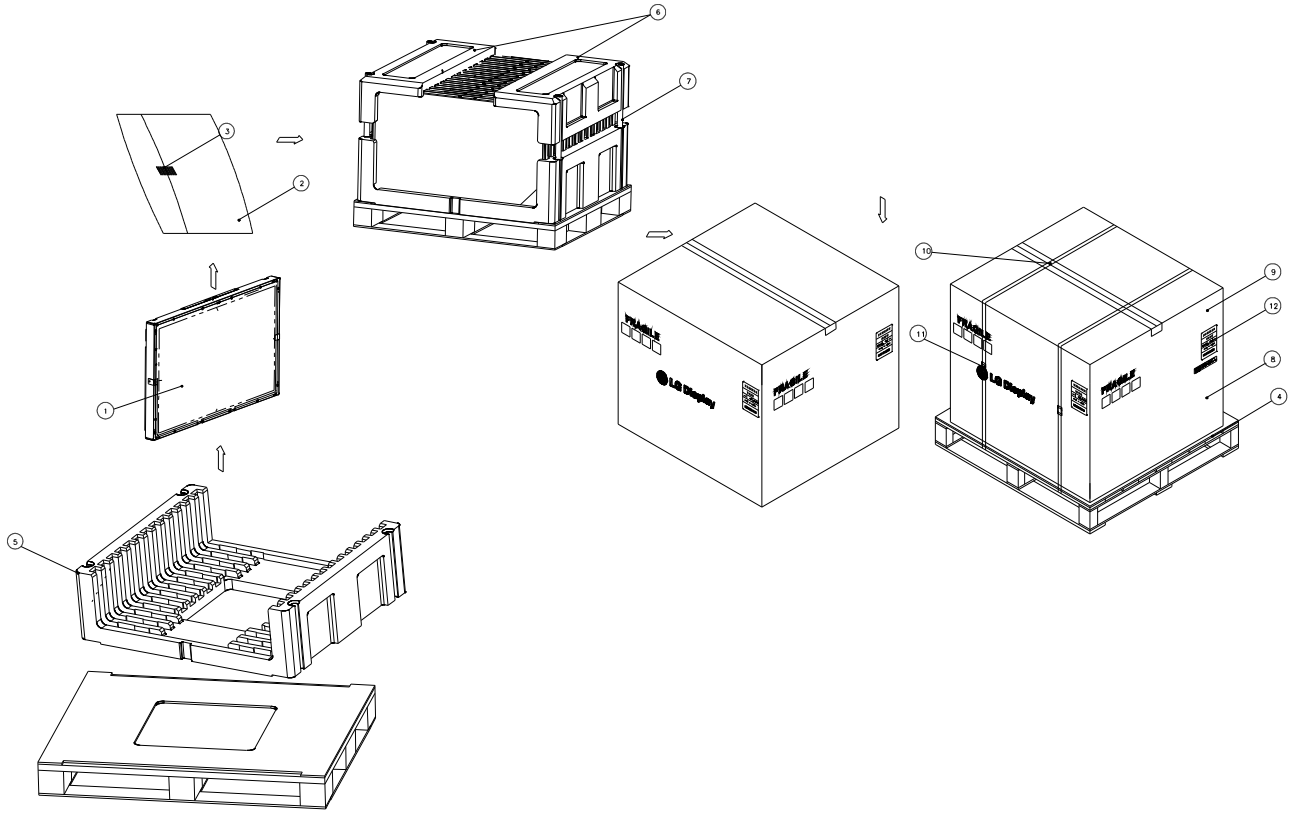
■ REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="H")



Note: 1. The LCD module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

APPENDIX-II

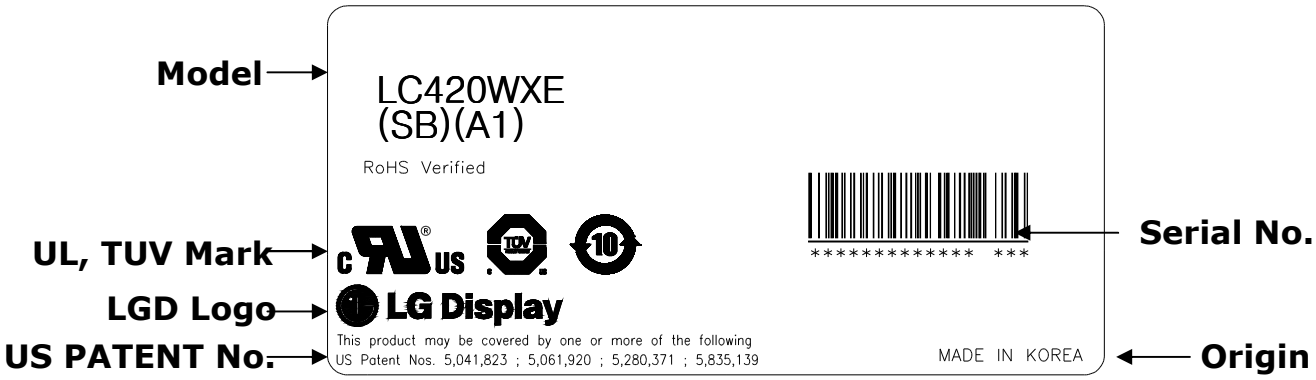
■ LC420WXE-SBA1 – Pallet Ass'y



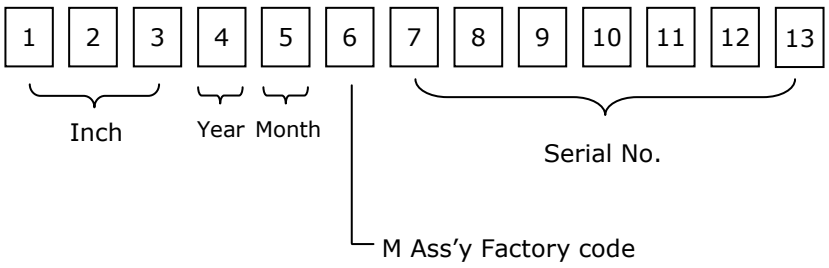
NO.	DESCRIPTION	MATERIAL
1	LCD Module	
2	BAG	42INCH
3	TAPE	MASKING 20MMX50M
4	PALLET	PAPER 1140X990X130MM
5	PACKING,BOTTOM	EPS
6	PACKING,TOP	EPS
7	ANGLE,POST	PAPER
8	ANGLE,PACKING	PAPER
9	BAND,CLIP	STEEL
10	BAND	PP
11	LABEL	YUPO 80G 100X100

 # APPENDIX- III

■ LCM Label

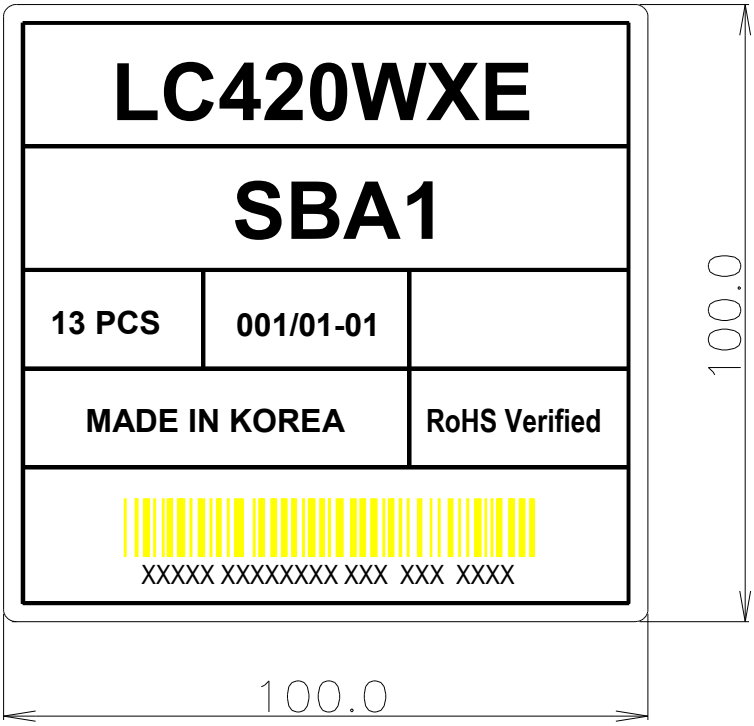


■ **Serial No. (See CAS 25page for more information)**



 # APPENDIX- IV

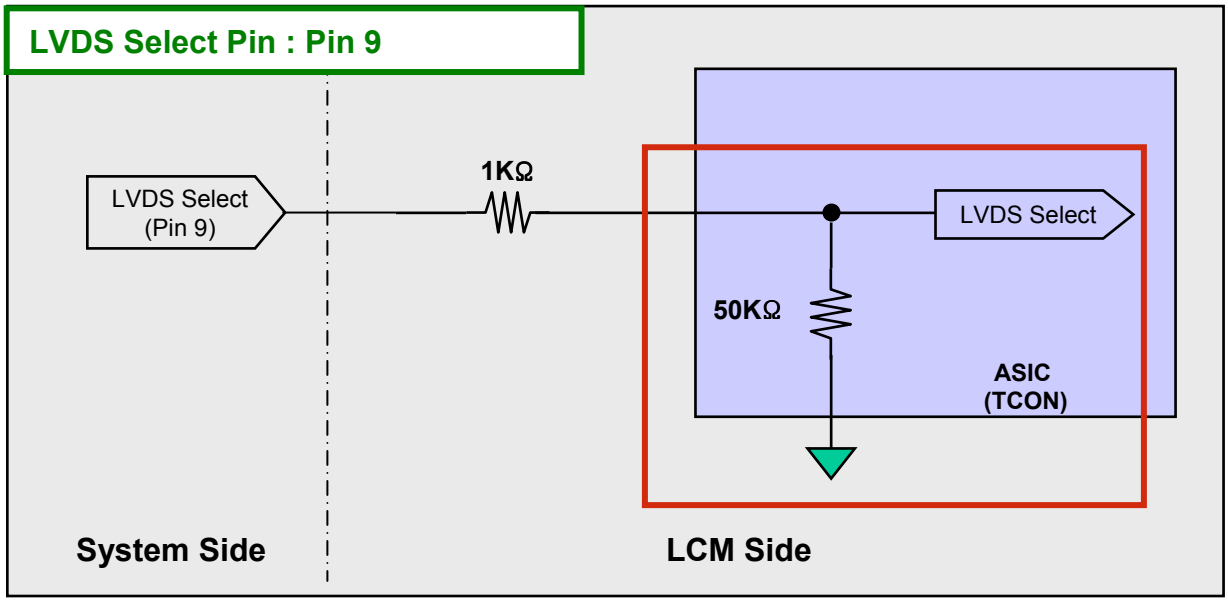
■ Pallet Label



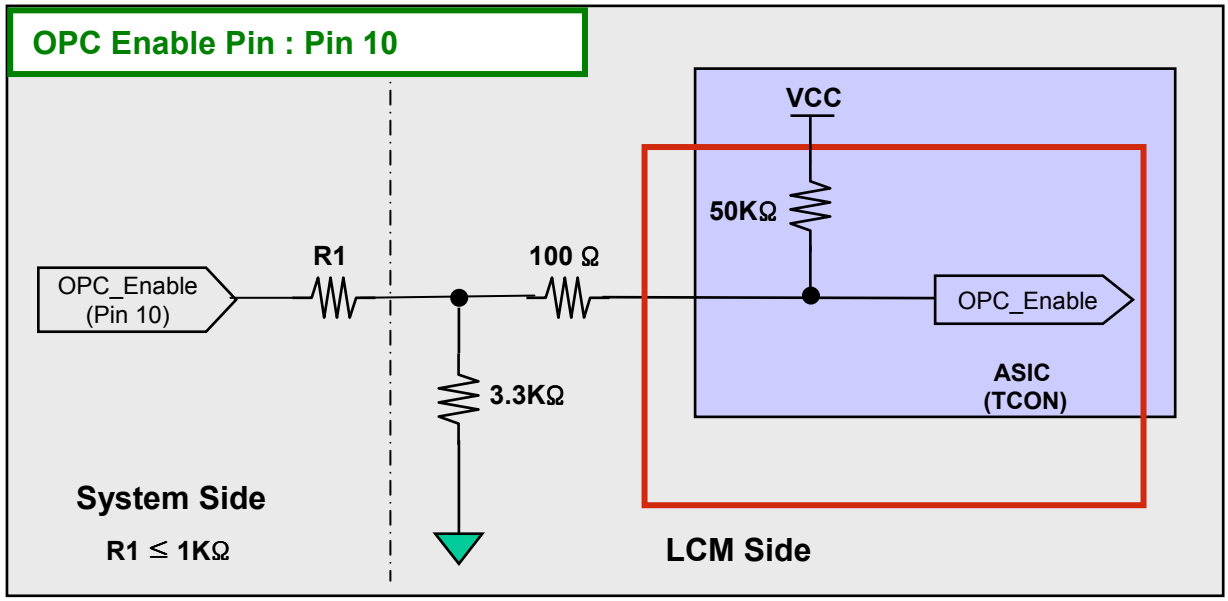
APPENDIX- V

Option Pin Circuit Block Diagram

Circuit Block Diagram of LVDS Format Selection pin



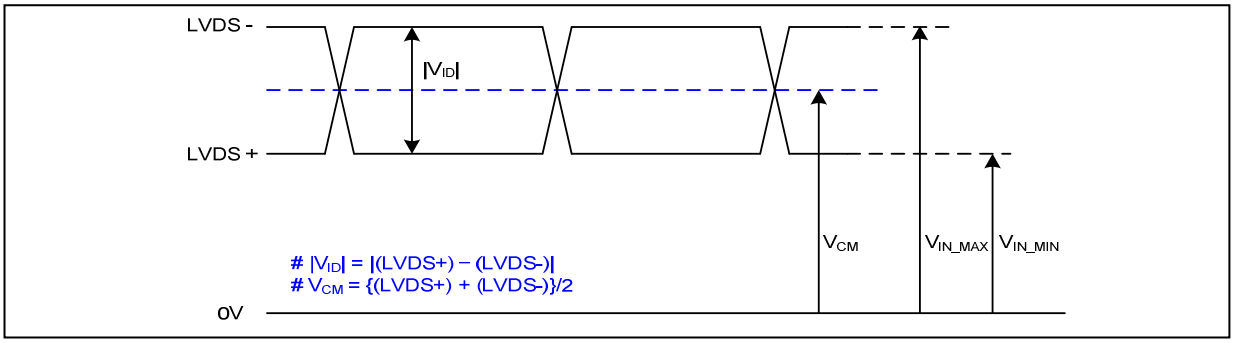
Circuit Block Diagram of OPC Enable Selection pin



 # APPENDIX- VI-1

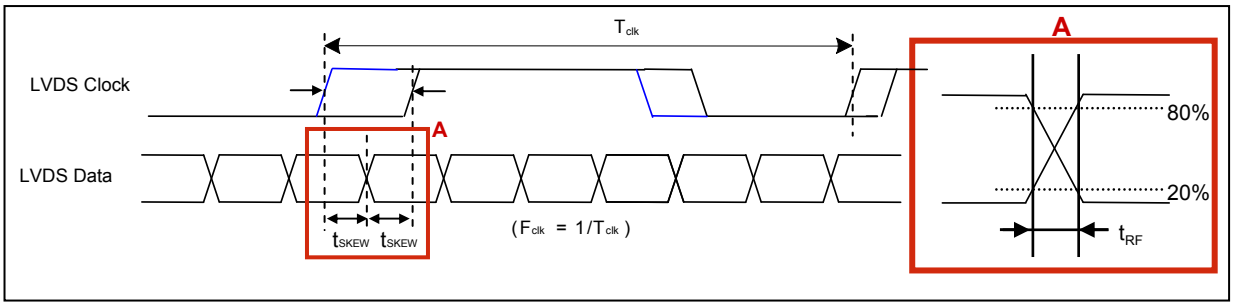
LVDS Input characteristics

1. DC Specification



Description	Symbol	Min	Max	Unit	Notes
LVDS Single end Voltage	$\|V_{ID}\|$	200	600	mV	-
LVDS Common mode Voltage	V_{CM}	1.1	1.5	V	-
LVDS Input Voltage Range	V_{IN}	0.7	1.8	V	-
Change in common mode Voltage	ΔV_{CM}		250	mV	-

2. AC Specification

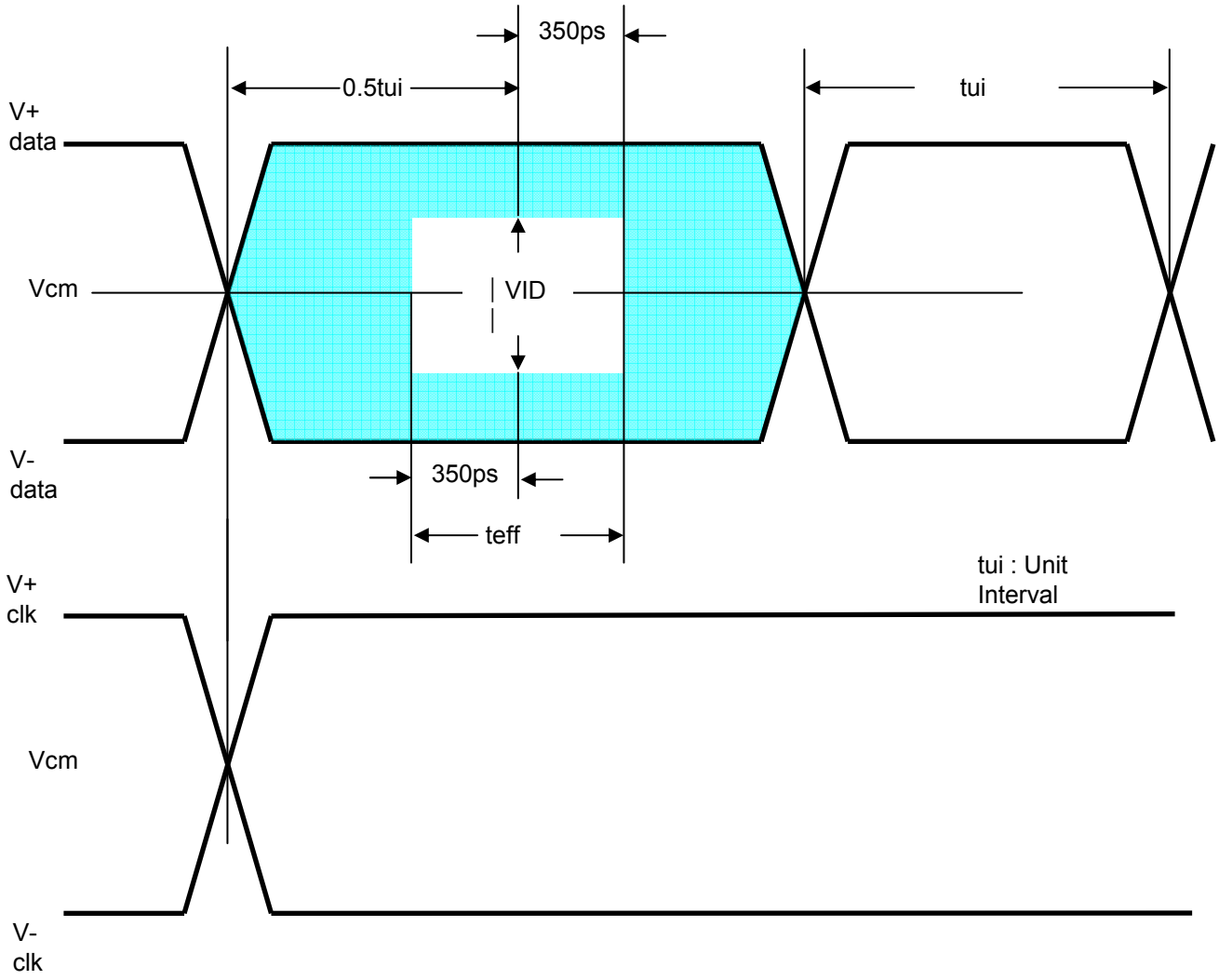


Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t_{SKEW}		$\|(0.25*T_{clk})/7\|$	ps	-
LVDS Clock/DATA Rising/Falling time	t_{RF}	260	$(0.3*T_{clk})/7$	ps	2
Effective time of LVDS	t_{eff}	±360		ps	-

Notes : 1. All Input levels of LVDS signals are based on the EIA 644 Standard.
2. If t_{RF} isn't enough, t_{eff} should be meet the range.

 # APPENDIX- VI-2

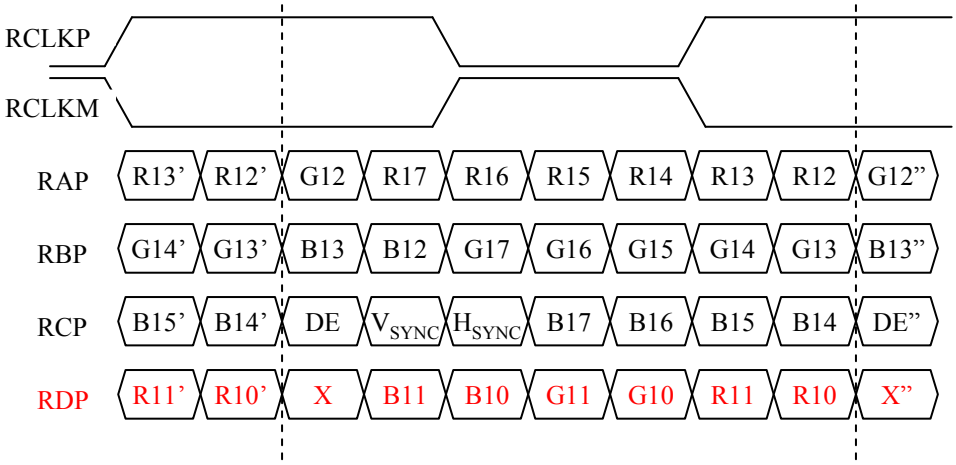
LVDS Input characteristics



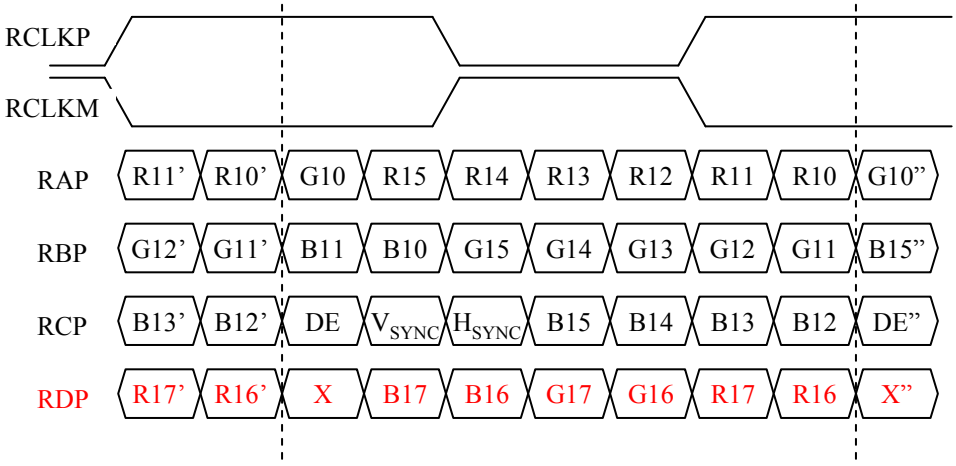
 # APPENDIX- VII

LVDS Data-Mapping info. (8bit)

■ LVDS Select : "H" Data-Mapping (JEIDA format)



■ LVDS Select : "L" Data-Mapping (LG format)



APPENDIX- VIII

Gray to Gray Response Time Uniformity

This is only the reference data of G to G and uniformity for **LC420WXE-SBA1** model.

1. G to G Response Time :
   Response time is defined as Figure3 and shall be measured by switching the input signal for "Gray (N) " and "Gray(M)".(32Gray Step at 8bit)

2. G to G Uniformity
   The variation of G to G Uniformity , $\delta_{G\ to\ G}$ is defined as :

$$\text{G to G Uniformity} = \frac{Maximum(GtoG) - Typical(GtoG)}{Typical(GtoG)} \leq 1$$

*Maximum (GtoG) means maximum value of measured time (N, M = 0 (Black) ~ 255(White), 32 gray step).

	0Gray	32Gray	64Gray	…	223Gray	255Gray
0Gray		TrR:0G→32G	TrR:0G→64G	…	TrR:0G→223G	TrR:0G→225G
32Gray	TrD:32G→0G		TrR:32G→64G	…	TrR:32G→223G	TrR:32G→255G
64Gray	TrD:64G→0G	TrD:64G→32G		…	TrR:64G→223G	TrR:64G→255G
…	…	…	…		…	…
223Gray	TrD:223G→0G	TrD:223G→32G	TrD:223G→64G	…		TrR:223G→255G
255Gray	TrD:255G→0G	TrD:255G→32G	TrD:255G→64G	…	TrD:255G→223G	

3. Sampling Size : 2 pcs

4. Measurement Method : Follow the same rule as optical characteristics measurement.

5. Current Status

   Below table is actual data of production on **DEC.08. 2008 (LGD RV Event Sample)**

	G to G Response Time [ms]		Uniformity
	Min.	Max.	
# 1	2.4	7.1	0.42
# 2	2.1	6.8	0.36